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Cognitive Science: How Do Deep Approaches to Learning Promote Metacognitive Strategies to Enhance Integrated Learning?

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Abstract

This research will examine how deep approaches to learning assist students in developing meta-cognitive strategies to enhance integrative learning. Research was gathered through two surveys using mixed methods, a triangulational study. Student data consisted of questionnaires with adaptations from the National Survey of Student Engagement (NSSE) 2011. The faculty survey was a questionnaire with adaptations from the Faculty Survey of Student Engagement (FSSE). Results reveals faculty measure success in promoting deep learning within and out of the classroom; the transference of new knowledge is obtained through writing intensive assignments, class projects, portfolios, collaborative discussions, undergraduate research, conference presentations, and self-reflections.

Literature Review

The word "learning" is used throughout P-16, affecting students at all levels from preschool through college. Have we as instructors paused to ask ourselves the following questions: Do students know how to learn? Have students been taught the necessary strategies to learn successfully and navigate in school or college properly? Do they know how to monitor their learning in order to make necessary adjustments in order to learn effectively? Additionally, have institutions provided the necessary training for faculty and staff to facilitate learning in environments where they teach? These rhetorical questions are posed to assist instructors examine how students learn and discuss ways in which educators can better prepare our students. Many times academicians take for granted that students come prepared to learn, ready for the challenges of rigorous reading and writing assignments, studying in groups, providing academic discourse, critically thinking and problem solving; yet we grapple with why students are unable to function in these capacities and struggle to pass the required state tests or praxis. The truth is, many students are learning life skills without their parents or guardians for the first time. Students are learning to live on their own, entering the world of work, participating in service organizations and other university involvement; while attending demanding courses and juggling all of these balls become their main focus. Consequently, for some, learning is not their first priority until its too late. For this reason, it is critical, that the subject of how students learn leads to a continuous topic for institutions of higher learning. The purpose of this study was to investigate if and how deep approaches to learning promote meta-cognitive strategies to enhance integrative learning.

Surface learning is referred to as the method by which students focus on the memorization of facts; thus adopting a rote learning, or surface learning approach (Smith & Colby, 2007). Little to no reflection, minimal engagement and a desire to simply achieve a passing grade are characteristics that embody the mind of the surface learner. Surface learning often appears as a safe, easy alternative to more cognitively challenging

deep learning. On the other hand, deep learning leads to greater productivity and successful academic outcome. Marton and Saljo (1976) first introduced the idea of deep learning in their study exploring student's approaches to specific tasks. Students were provided with a text and told that they were to read the text and would later be asked questions regarding what they read. Marton and Saljo categorized the student's approaches to reading and answering the questions into two categories. The first category of students not only read the text to acquire information, but they read in order to understand the meaning of the text. In other words, these students espoused or promote a deeper approach to learning.

National Survey for Student Engagement (NSSE) researchers created their DEEP Scales using reflective measures of experiential proxies to represent students' overall tendency to employ deep learning processes. The Nelson Laird study (2008), however, is perhaps the only large-scale, nation-wide analysis published thus far that explicitly links deep learning activities with college student outcomes. Faculty members can engage students in group work, which holds students accountable for their own learning and requires understanding of the subject matter in order to function in the group (Hall, et al., 2004). Institutions can also include first-year seminars that require reflection and integration of knowledge (English, et al., 2004), or plan for such integration through intentionally designed learning communities (Cole, Mccormick, & Kinzie, 2009).

The Association of American Colleges and Universities (AAC&U) emphasizes the importance of identifying "high-impact practices" that improve students' educational attainment focus almost entirely on interventions meant to encourage deep approaches to learning: writing intensive courses, collaborative assignments, undergraduate research, service learning, and capstone courses and projects – all practices. Kuh (2008) suggests encourage student to adopt deep approaches to learning.

Connecting learning to something directly relevant to the student as a person is a basic concept in creating an active environment (Zakrajsek & Rosier, 2006). As teachers, we need to consider approaches to instruction that allow students to involve themselves in their own learning processes. They must be given opportunities to construct, question, transfer, critique and apply their new learning. Students' understanding improves when they actively construct meaning and try to make sense of the material.

Metacognitive strategies allow students to reflect on what they learn, make adjustments when necessary, and determine how they want to proceed in moving towards their learning target. Zull uses the term "metacognition" to underscore the need for students to think about what they are doing. Metacognition lies at the heart of all learning: "the ultimate outcome of the journey [from brain toward mind] is to understand your own understanding" (Zull, 2011, p. 15).

Much research has been done in the field of education on the importance of developing metacognitive strategies to facilitate learning. Metacognitive strategies can be described as processing strategies that include planning and monitoring to promote cognitive mastery (Pintrich, Smith, Garcia, & McKeachie, 1993). With different metacognitive strategies, students have the ability to take learning into their own hands.

Based on the review of literature, the hypothesis reveals that faculty measure success in promoting deep learning within and out of the classroom; the transference of new knowledge to prior knowledge is obtained through writing intensive assignments, class projects, portfolios, collaborative discussions, undergraduate research, presentations, and self-reflections. Research reveals practicing deep learning as opposed to surface learning gives students the opportunity to better retain information and make connections to other subject areas. It provides teachers the opportunity to adjust instruction to meet students' needs: what is appropriate and why; effective implementation, organization, and planning; re-teaching, enrichment and extensions; instructing and demonstrating; providing feedback; questioning and problem solving; thus enhancing the learning paradigm. Deep learning promotes meta-cognition strategies, strategic thinking, critical thinking, reasoning skills, connections to relevant learning, and creativity. Thus, students are able to integrate information learned in order to enhance integrative learning experiences.

Methodology

In this study, both students and faculty were questioned on deep learning approaches using online surveys. The student survey was a questionnaire adapted from the National Survey of Student Engagement (NSSE) 2011. The faculty survey was a questionnaire adapted from the Faculty Survey of Student Engagement (FSSE). Additional qualitative comments were collected and the data were analyzed. Collectively, data from these sources provide a multi-dimensional profile of participating students' academic preparation, college experiences, reported gains in their knowledge, skills, and personal development, and critical thinking. The participants in this study (both faculty and students) were at an institution in Central Illinois with approximately 11,000 students. The research study included freshman, sophomores, juniors, seniors, and graduate students. The student survey had 337 respondents and the faculty survey had 85 respondents.

Data Analysis and Results

We made a comparison of the level of higher-order learning activities between various groups of disciplines. The four groups were Arts and Humanities (AH), Business and Applied Science (BAS), Education and Professional Studies (EPS), and Sciences (SCI). The Arts had the highest level of Synthesis and the lowest levels of Analysis, Judgment and Application. Sciences had the highest levels of Judgment and Application and Business had the highest reported level of Analysis. Education ranked high in Application and ranked lowest in synthesis and judgment (Table 1).

Table 1. Higher-order learning activities by college.

Scale: Very Much = 1 to Very Little = 4

	M	SD	N
Analysis			
AH	2.10	0.889	41
BAS	1.72	0.783	60
EPS	2.03	0.851	110
SCI	1.87	0.837	90
Synthesis			
AH	1.95	0.973	41
BAS	2.07	0.756	60
EPS	2.20	0.990	110
SCI	2.05	0.856	90
Judgment			
AH	2.17	0.946	41
BAS	2.34	0.911	60
EPS	2.42	0.971	110
SCI	2.10	0.852	90
Application			
AH	2.24	0.906	42
BAS	2.15	1.014	61
EPS	2.15	0.979	110
SCI	2.00	0.856	90

We compared the degree of engagement in reflective learning activities for students with high vs. low deep learning activity using independent samples T-test. The higher-order learning activities (HOLA) were analysis, synthesis, judging the value of information, and application of theories. The reflective learning that students were surveyed on were examining the strengths and weaknesses of you own views (ESW), better understanding someone else's views by imagining how an issue looks from their perspective (USEV), and learning something that changes the way you understand an issue or concept (LSCU). For the most part, high engagement in HOLA's corresponded to significantly higher engagement in reflective learning activities (Table 2). We also analyzed the data to see if there was any effect of level of Higher-Order Learning Activities (HOLA) on whether students thought their learning was integrated. We found no significant differences for any of the four HOLA's, but there were trends for a greater perception of having had integrated learning with higher levels of engagement in HOLA's.

Table 2. Differences in Engagement in Reflective Learning (High HOLA vs. Low HOLA).
Scale: Very Much = 1 to Very Little = 4

	High HOLA		Low HOLA			
	M	SD	M	SD	df	t
Analysis						
ESW	2.24	0.830	2.48	0.853	329	2.260*
USEV	2.12	0.786	2.34	0.841	328	2.158*
LSCU	2.19	0.741	2.41	0.867	326	2.284*
Synthesis						
ESW	2.18	0.833	2.48	0.805	330	3.187**
USEV	2.06	0.793	2.32	0.801	329	2.795**
LSCU	2.11	0.746	2.49	0.775	327	4.316**
Judgment						
ESW	2.16	0.815	2.48	0.858	332	3.460**
USEV	2.06	0.809	2.29	0.792	331	2.533*
LSCU	2.17	0.749	2.33	0.811	329	1.856
Application						
ESW	2.13	0.806	2.55	0.851	332	4.502**
USEV	1.97	0.767	2.48	0.792	331	5.836**
LSCU	2.06	0.728	2.53	0.773	329	5.545**

*p < .05, **p < .01.

Students were asked to describe ***how*** they were able to connect what they have learned to their lives. The answers were assigned to categories of higher-order learning, integrated learning and reflective learning. There were 33 instances of HL, 86 instances of IL, and 35 instances of RL. From the qualitative data, "relevant learning" emerged as the theme. There were 4 types of connections: life connections from curriculum(LC), Co-curricular connections(CC) Mentoring and personal connections(MP) and Community Outreach connections(CO). Students highest connection came when they shared connections from their content/ curriculum areas to their personal life. Co-curricular connections were the next highest for students. Faculty members were also asked to report on various teaching activities both in and out of the classroom. Faculty had a high level of engagement in all activities (Table 3).

Table 3. Faculty Activities (N = 83).
Scale: Never = 1 to Often = 4

Activity	M	SD
Deep Learning		
Analysis	3.80	0.401
Synthesis	3.88	0.331
Assess validity of information	3.31	0.795
Intentionality		
Discuss integrative learning	2.66	1.009
Use integrative learning	3.38	0.768
Reflection		
Review information from earlier in the current day	3.46	0.650
Review previous days' material	3.49	0.651
Use simple review questions	2.88	0.929
Require review activities	3.24	0.829
Problem Solving		
Present practical applications	3.78	0.416
Present a problem requiring outside information	3.42	0.646
Apply knowledge to problem outside normal context	3.02	0.826
Collaboration		
Collaborate outside class	2.94	0.960
Collaborate inside class	3.24	0.854
Collaborate outside major field	2.33	0.957
Engagement		
Encourage active learning	3.68	0.566
Encourage hands on learning	3.66	0.635
Promote internships and lab experiences	3.00	1.006
Metacognition		
Provide effective methods to better understand material	3.59	0.543
Teach basic skills needed to utilize information	3.78	0.449
Encourage co-curricular experiences	3.41	0.842

Instructors were asked how they measure their success in promoting deep level and integrated learning within the classroom. The answers were categorized into higher-order learning, integrated learning, and reflective learning. There were 8 instances of HL, 24 instances of HL, and 6 instances of RL. Instructors were also asked what are the ways in which they connect with students outside the classroom. Again, the answers were categorized into higher-order learning, integrated learning, and reflective learning. There were 9 examples of HL, 79 instances of IL and 22 instances of RL. Faculty were asked: What are the ways you connect with your students outside of the classroom? Faculty connections were consistent with student connections with making life connections through content or curricular discussions the highest connection. Mentoring/personal connections served as the next highest as faculty mentored both undergraduate and graduate students in the area of research and other areas pertaining to the life of the institution. Several "high impact" learning experiences were provided.

Discussion

Research suggests that a large part of the impact of college is determined by the extent and content of students' interactions with the major agents of socialization on campus: faculty members and student peers. Further, faculty members' educational influence appears to be significantly enhanced when their contact with students extend *beyond* the formal classroom. At the institution in this study, faculty embraced programs such as: faculty fellows, undergraduate mentoring, dining with students at the Charleston Chew, study hall group discussions, or attending sports events to enhance student personal contact. Personal connection is a way to assist with retention efforts and can be viewed as a vital part of the university community to enhance the life of the students. Additionally, faculty members from various colleges or disciplines are encouraged to strive to teach to the higher levels of Blooms Taxonomy; further increasing deep learning experiences to enhance integrated learning.

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